

Annex 5

Comments Received in Response to FCC Invitation for Public Comments on Recommendation 11 (450-470 MHz Proposal for MSS Uplinks), and Reply Comments by Leo One

Leo One examined the Advisory Committee's public files and found three sets of comments opposing the Draft proposal. They were submitted by the Affiliated American Railroads (AAR), the Industrial Telecommunications Association, Inc. (ITA), and Motorola. Many of the comments were similar and sometimes identical oppositions to the Draft proposal. For brevity, Leo One will group similar comments and will reply to each set.

Comments: The ITA in two comments (at 3. on page 3, and 10. on page 6) put conditions for sharing as "...without causing interference to incumbent PLMRS systems," and "...without increased interference...." The AAR in several comments takes the position that no amount of interference is acceptable (at Summary on page i, at III on page 7, and at III on page 8).

Leo One Reply: When co-frequency sharing occurs, some interference is inevitable. As the light from a candle on earth illuminates the moon, the signal from one system has an effect (albeit small) on another system operating at the same frequencies. The affected service needs to establish interference limits. Even the radio astronomy service can accept interference, though the limit is a power flux density of -255 dB (W/m²/Hz).

Comment: Motorola (at III on page 17) notes that, "A conservative estimate is that 10 per cent of the radios operating in the 450 MHz band are not licensed."

Leo One Reply: One wonders how the land mobile community can deal with the potential interference and the 10% loss of spectrum capacity caused by about 500,000 illegally unlicensed radios, and is yet concerned about the potential interference effects of a MSS network that would use only 0.04% of the channel capacity. (A single non-GSO MSS network co-frequency sharing with the LMS in 20 MHz of bandwidth would use less than 0.04% of the channel capacity available to terrestrial systems within the satellite beam.)

$$6 \text{ channels} / (20 \text{ MHz} \div 25 \text{ kHz/channel} \times 20 \text{ times frequency reuse}) = 6/16000 = 0.04\%$$

Comments: The AAR in two comments alleges that frequency sharing has not been demonstrated (at Summary on page i and at 2. on page 6.) and that additional studies are necessary to determine the feasibility of sharing between MSS and land mobile systems. The ITA also in two comments questions the feasibility of sharing (at 5. on page 4 and at 10. on page 6.)

Leo One Reply: ORBCOM in flight demonstrations and tests at 148-149.9 MHz has demonstrated the feasibility of frequency sharing using the DCAAS (dynamic channel activity assignment system) to identify and use channels that are temporarily unused by the LMS systems in that band. Leo One has provided analyses both nationally and internationally that show the feasibility of frequency sharing by calculating the probabilities of interference to be extremely low. (See documents WP 8D/150, IWG-

2A/59(Rev. 2) and its Addendum.) The AAR misrepresents the CPM-97 Report by alleging that the Report calls for additional studies to determine the feasibility of MSS and LMS sharing. The additional studies identified in the CPM-97 Report are to examine some specific cases among the plethora of sharing scenarios that exist between MSS and LMS systems. There are only two mentions of "feasible" or "feasibility" in the CPM-97 Report with regard to MSS and LMS sharing. In one case the sentence begins, "The conclusion reached to date, as a result of an in orbit demonstration test, is that it is feasible for narrow-band uplinks of a single non-GSO MSS using DCAAS to share spectrum with certain land mobile services...." In the other case the sentence begins, "Sharing may be feasible in other bands below 1 GHz...." The CPM-97 Report text is positive towards the feasibility of MSS and LMS frequency sharing.

Comments: The AAR made one comment (at VII on page 16) that the sharing studies did not consider the characteristics of land mobile systems as described in the IWG-2A Report. Motorola made seven comments on the cases or sharing scenarios that had not been analyzed: (at III on page 13) Motorola alleged "inadequate representations of the existing terrestrial land mobile operating environment..., ...the study...ignores the existence of land mobile repeaters....," (at iii on pages 13 and 14) Motorola states "the study...only considered interference to mobile units operating at low elevations," (further at III on page 14) Motorola alleges "does not ... account for the use of squelch, ...the use of ... digital control channels ..., ...fails to account for the tremendous range in technical characteristics of terrestrial land mobile services operating in the US."

Leo One Reply: The baseline sharing studies that were provided to national and international meetings used characteristics of LMS systems that were the same or very close to those listed in the IWG-2A Report, e.g., 25 kHz channel spacing, 16 kHz bandwidth, analog FM, digital modulation, -140 dBW at edge of coverage area, and $C/(I+N)$ equal to 10.7 dB. The full range of characteristics were not used in the baseline analyses, however the analyses may be readily extended to specific particular cases. Not all of the many hundreds of possible sharing scenarios have been analyzed, nor is it necessary that they all be analyzed before making additional frequency allocations to the MSS. The effect of MSS transmissions on land mobile receiver squelch circuits was addressed in the Addendum to Doc. IWG-2A/59 (Rev. 2), February 13, 1997. In part the response was:

"The probabilities calculated in Doc. IWG-2A/59 (Rev. 2) are the probabilities for $C/(N+I)$ dropping below a threshold value. Merely crossing this threshold does not activate the squelch circuit. Much greater interference power is required to activate squelch, and this occurs with much lower probability."

The use of repeaters in the LMS was addressed in the same document:

"The basic criteria that determines the acceptability of the potential interference is the availability (as perceived by a user) for the particular channel that he is trying to use. When the user listens - if there is interference from a MES, the statistics as modeled in Do. IWG-2A/59 (Rev. 2) fit the case. The fact that 5 or 10 or more other listeners are also experiencing interference from the same source does not change the availability of the signal to that particular user. When the user transmits - his channel availability for transmission is not changed by the fact that any interference that occurs may be "repeated" to a number of receivers. The statistics are still valid for his channel."

For short duration digital control channels, the same paper provided information that for a 23 ms signal duration (a value cited by Israel at CPM-97 in document CPM97/80) the

band scanning receiver sensitivity would be about 30 mW for LMS transmitter power at 460 MHz. Generally, LMS transmitters greatly exceed this power level and would be very readily detectable by the MSS band scanning receiver.

Comment: Motorola comments that the number of terrestrial users in the 450-470 MHz band would be so large that the MSS networks would be unable to find a sufficient number of clear channels in which to operate (at III on pages 15-17). Numbers are cited from earlier calculations performed by Leo One.

Leo One Reply: The number of terrestrial users obtained in the Leo One calculations were for very conservative modeling under multiple worst case assumptions, and the resultant numbers were calculated as lower bounds on the number of terrestrial users to provide a minimum average of six clear channels per satellite. In general, more than one satellite is in view and the number of clear channels is greater than six for the minimum number of land mobile stations calculated. Alternately, for only six channels available with multiple satellites in view, the minimum number of terrestrial users increases. These factors combine to provide a sufficient number of clear channels even with the increased number of land mobile users that might result from re-farming.

Comment: The AAR (at II on page 7) recommended that the US advancing a proposal for Little LEO uplinks in the 450-470 MHz band "would be premature, contrary to the position of the international community...."

Leo One Reply: The proposal would certainly not be premature, for the sharing studies have been under way for nearly two years. The international community has accepted the studies as being supportive of the feasibility of sharing as noted in a prior Reply. And the additional studies cited are to examine specific cases, not "to determine the feasibility", as claimed by the AAR.